REMARKS

The Examiner is thanked for the due consideration given the application. Claims 1, 2 and 4-21 are pending in the application. No new matter is believed to be added to the application by this response.

Entry of this response under 37 CFR §1.116 is respectfully requested because it places the application in condition for allowance.

Rejections Under 35 USC §103(a)

Claims 1, 2, 4-7 and 10-18 have been rejected under 35 USC §103(a) as being unpatentable over KASUYA et al. (J. Phys. Chem. B, Vol. 106, No. 19 (2002) pp. 4947-4951) in view of IIJIMA et al. (Chemical Physics Letters, Vol. 309 (1999) pp. 165-170). Claims 8, 9, 14, 19, 20 and 21 have been rejected under 35 USC §103(a) as being unpatentable over KASUYA et al. in view of IIJIMA et al., and further in view of PERRY et al. (U.S. Patent 6,372,103) These rejections are respectfully traversed.

The present invention pertains to a method of forming carbon nanohorns that optimizes pulse width and pause width to achieve increased nanohorn production. The present invention is illustrated, by way of example, in Figure 1 of the application, which is reproduced below.

FIG. 1

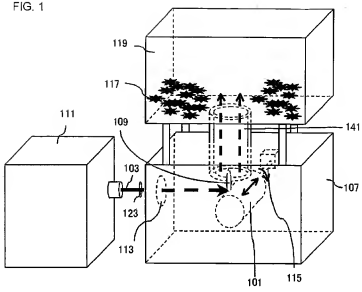
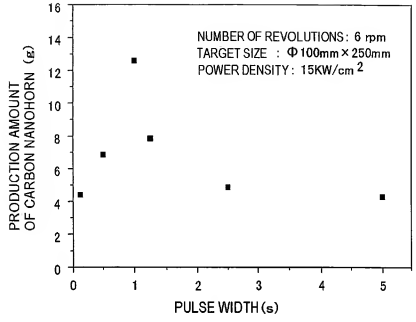


Figure 1 shows a graphite target (rod) 101 that is rotated at a constant speed while being pulsed with a laser beam 103. Claim 1 of the present invention recites a ratio relationship: "a condition of irradiation with said pulse light satisfies expression (1):

$0.5 \leq (\text{pulse width})/(\text{pulse width} + \text{pause width}) \leq 0.8$ (1)."

The results of optimized pulse width and pause width can be readily seen in the results shown in Figure 2 of the application, which is reproduced below.

FIG. 2



As can be seen, the proper selection of conditions result in an unexpected tripling in the amount of nanohorns produced.

KASUYA et al. pertain to the production of single-wall carbon nanohorn aggregates. The paragraph bridging pages 4947 and 4948 of KASUYA et al. discusses laser vaporization of a graphite rod at a pulse width of 500 ms (but see claim 19 of the present invention).

KASUYA et al. fail to disclose a ratio relationship of $0.5 \leq$ (pulse width)/(pulse width + pause width) ≤ 0.8, such as is set forth in claim 1 of the present invention.

The Official Action acknowledges that KASUYA et al. is silent to the step wherein an irradiation position of the pulse light is moved at substantially constant speed when the surface

of the graphite target is irradiated with the pulse light. The Official Action refers to IIJIMA et al., which at page 166, first column, line 14 discuss rotating a graphite rod at 6 rpm. However, this teaching of IIJIMA et al. fails to address the above-discussed deficiencies of KASUYA et al.

The Official Action asserts that specific conditions in the paragraph bridging pages 4947 and 4948 of KASUYA et al. fulfill the claimed ratio of $0.5 \leq$ (pulse width)/(pulse width + pause width) ≤ 0.8.

However, as has been noted in the last response, extrapolating a mathematical relationship from raw data has been found to be impermissible. See *Harries v. Air King Products Co*, 183 F.2d 158, 86 U.S.P.Q. 57 (2d Cir. 1950).

In the Response to Arguments at page 9, the Official Action asserts: "*The argument and citation to case law are not persuasive for at least the reasons that (1) the case is not similar to the circumstances of this case which are a calculation, rather than an extrapolation or interpolation, (2) the case was decided prior to the 1952 Patent Act, and it is unclear that case cited retains its vitality in view of this important statutory change, and (3) the cited case is no longer believed to reflect the Federal Circuit's or the Supreme Court's holdings regarding obviousness of ranges.*"

In rebuttal, first it is noted that *Harries* pertains to the extrapolation of a ratio from data. In this case the claimed

ratio is $0.5 \leq$ (pulse width)/(pulse width + pause width) ≤ 0.8, which is not revealed in the prior art. Also, finding a set of values that satisfies the ratio is not sufficient. The discussions in MPEP 2131.03 and MPEP 2144.05 pertain to ranges, not ratios, and thus do not pertain.

Second, *Harries* has been cited by the Federal Circuit subsequent to the 1952 Patent Act. See, e.g., *Pall Corporation v. Micron Separations*, 66 F.3d 1211, 36 U.S.P.Q. 2d 1225 (Fed. Cir. 1995)(Concurring opinion). Indeed, *Harries* has been quoted in the Wikipedia discussion of patentability. See http://en.wikipedia.org/wiki/Patentability.

Third, since the issue is a ***ratio*** and not obviousness of ranges, the Federal Circuit's or the Supreme Court's rulings regarding obviousness of ***ranges*** (such as in *Titanium Metals Corporation v. Banner*, 728 F.2d 775, 227 U.S.P.Q. 773 (Fed. Cir. 1985)) does not apply.

Rather, it is urged that the applied art references lack sufficient teaching, suggestion or motivation to produce the claimed ratio. See *KSR International Co. v. Teleflex Inc., et al.*, 550 U.S. 398, 127 S. Ct. 1727, 82 U.S.P.Q.2d 1385 (2007).

The teachings of PERRY et al. fail to address the deficiencies of KASUYA et al. and IIJIMA et al. discussed above.

Therefore, one of ordinary skill and creativity would fail to produce a claimed embodiment of the present invention from a knowledge of KASUYA et al. and IIJIMA et al. (and PERRY et

al.). A *prima facie* case of unpatentability has thus not been made.

Also, the unexpected results shown in Figure 2 of the application fully rebut any unpatentability that could be alleged.

These rejections are believed to be overcome, and withdrawal thereof is respectfully requested.

Conclusion

The Examiner is thanked for considering the Information Disclosure Statement filed November 2, 2005 and for making an initialed PTO-1449 Form of record in the application.

Prior art of record but not utilized is believed to be non-pertinent to the instant claims.

The rejections are believed to have been overcome, obviated or rendered moot and no issues remain. The Examiner is accordingly respectfully requested to place the application in condition for allowance and to issue a Notice of Allowability.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 25-0120 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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